

## Program Plans - Alternate Processes for Partial Expansion of Tobacco

### Project Statement

Develop and evaluate processing alternatives to the DIET process to produce partially expanded tobacco for inclusion in cigarette blends, which will reduce cigarette density to 0.18 g/cc while maintaining physical and subjective characteristics.

### Project Objectives

Define alternate expansion process(es) to be evaluated in a pilot plant development system to meet the criteria of the project statement.

1. Review and summarize previous work.
2. Identify potential processing schemes and test concepts with existing equipment, lab evaluations, and/or vendor tests.
3. Construct a pilot development facility.

For each process determine acceptable combinations of feedstock and processing conditions for all Philip Morris brands and evaluate their economic impact as outlined below.

4. Determine the relationship between processing conditions and subjective/physical properties for each tobacco type (bright, burley, oriental).
5. Compare the effect of blend expansion in various combinations with the expansion of individual blend components on subjective/physical properties.
6. Determine the contribution of DIET and ES components to subjective/physical properties both as standard expanded products and as included in partial expansion.
7. Analyze blend similarities and production requirements for all brands.
8. Propose one or more processing schemes for detailed physical, chemical, subjective, and economic evaluation.

2021554169

## **Program Plans**

### **I. Review and Summarize Previous Work**

- A. Review final reports June 1990
  - 1. WET
  - 2. Hauni steam tunnel
  - 3. Hambro dryer
  - 4. Microwave expansion
- B. Summarize results in memo June 1990

### **II. Identify and Test Potential Processing Schemes**

- A. Conduct brainstorming session July 1990
- B. Confirm previous results in pilot plant June-July 1990
  - 1. WET
  - 2. Hauni tunnel/Hambro dryer
- C. Expand upon "old" concepts in pilot plant June -July 1990
  - 1. Impregnation/Adt dryer
  - 2. Impregnation/Hauni tunnel/dry
  - 3. Superwet/Hauni tunnel/dry
- D. Complete small scale trials of other concepts July-August 1990
  - 1. cellulase treatment
  - 2. peroxide expansion
  - 3. carbonated water
  - 4. concepts from brainstorming session
- E. Apply promising equipment/processes from group's work September 1990
  - 1. constant moisture heating
  - 2. flash dryers
  - 3. gaseous impregnation
  - 4. high moisture impregnation/expansion
- F. Set up process for evaluation of microwave expansion with assistance from Development Engineering August-October 1990

2021554170

- G. Evaluate trials ongoing
1. Equilibrated CV/OV
  2. SV
  3. Chemical Analysis
  4. Subjective screening
- H. Choose the most promising scheme(s) for more refined testing  
Oct.-December 1990

### III. Construct pilot development facility

- A. Define process flow scheme(s) November 1990
1. Need for flexibility
  2. Range of operating parameters
- B. Specify requirements December 1990
1. Equipment
  2. Space
  3. Utilities
  4. Instrumentation
  5. Sampling ports
- C. Review process scheme with PM Engineering December 1990
- D. Prepare 650 or Job Order and obtain approval Dec. 1990-Jan. 1991
- E. Prepare detailed design and layout with Development Engineering  
January 1991
- F. Order and receive equipment, instrumentation, etc. Jan.-April 1991
- G. Installation and checkout of equipment May-June 1991

Once the pilot development facility is completed a detailed process development program will be undertaken as described below. Timescales for the project will be discussed separately.

#### **IV. Determine Fundamental Relationships**

- A. Assess the effect of tobacco type**
  - 1. DBC Bright
  - 2. DBC Burley
  - 3. Oriental
  - 4. Total Marlboro blend
- B. Determine the effect of processing conditions**
  - 1. Temperatures
  - 2. Steaming rates
  - 3. Tobacco feed rate
  - 4. Impregnation
  - 5. Residence time
- C. Evaluate/Characterize products**
  - 1. SV
  - 2. Equilibrated CV/OV
  - 3. Chemical Analysis
  - 4. Subjective screening

#### **V. Determine the Effect of Blend Expansion**

- A. Apply information from fundamental studies to predict results**
- B. Assess the effect of blend type**
  - 1. DBC bright and DBC burley
  - 2. DBC bright and Oriental
  - 3. Oriental and DBC burley
  - 4. DBC bright, burley and Oriental
  - 5. Total Marlboro blend
- C. Assess the effect of process conditions**
  - 1. As determined from fundamental studies

2021554172

- D. Evaluate Products
  - 1. SV
  - 2. Equilibrated CV/OV
  - 3. Chemical analysis
  - 4. Subjective evaluation in blends
  - 5. Cigarette physical/smoke evaluation of selected blends
- E. Compare results to individually expanded materials that are blended together

**VI. Assess the Contribution of DIET and ES**

- A. Choose several models (blend and process conditions) from previous studies
- B. Add back DIET bright feedstock and ES feedstock (CRS) to the blend before partial expansion
- C. Evaluate blends
  - 1. Blend equilibrated CV/OV
  - 2. Chemical analysis
  - 3. Detailed subjective evaluation
  - 4. Detailed physical/smoke evaluation of cigarettes
- D. Compare results to same blends but with standard DIET and ESB added

All testing during the first three phases will use tobacco cased with standard DETA casing. The addition of more traditional blend casings will be addressed only under the detailed final evaluation of one or more processing schemes.

2021554173

## **VII. Recommend and Evaluate the most promising scheme(s)**

- A. Evaluate blend similarities for all brands
- B. Assess production requirements for all brands
- C. Assess the effect of casings on subjective, physical, and chemical properties
- D. Detail and evaluate potential processing concerns in a manufacturing environment for each scheme
  - 1. Blending
  - 2. Casings
- E. Conduct complete physical, chemical, smoke, and subjective characterization with assistance from Product Development
- F. Complete scale-up calculations and recommendations

## **Timescales**

Outlined below is a detailed timescale for completion of the program after the completion of the pilot development process, broken down by each of the development phases previously discussed. The estimated completion dates for the various tasks assumes 2 days/week testing. In addition, it has been assumed that standard technician support for pulling/submitting samples and running sieves will be available from the D Pilot Plant Technicians. Gantt charts for the program schedule are attached.

## **IV. Determine Fundamental Relationships**

- |                       |                  |
|-----------------------|------------------|
| •test design          | April 1991       |
| •testing              | May-June 1991    |
| •subjective screening | July 1991        |
| •data evaluation      | July-August 1991 |

## Timescales (cont'd)

### **V. Determine the Effect of Blend Expansion**

•test design	July 1991
•testing	August 1991
•cigarette preparation/physical evaluation	September 1991
•subjective evaluation	September 1991
•data evaluation	October 1991

### **VI. Assess the Contribution of DIET and ES**

•test design	October 1991
•testing	November 1991
•cigarette preparation	December 1991
•cig. physical/smoke evaluation	Dec. 1991-Feb. 1992
•detailed subjective evaluation	Dec. 1991-Feb. 1992
•data evaluation	Jan.-February 1992

### **VII. Recommend and Evaluate the most promising scheme(s)**

•evaluation of blends/production reqmts.	ongoing
•assess effect of casings	February 1992
•detail/evaluate processing concerns	Feb.-March 1992
•final characterization of recommended schemes	March-April 1992
•equipment scale-up calculations/recommendations	May 1992
•final report and transfer of technology	June 1992

## Resource Requirements

**Semiworks Primary:**

- Blend preparation of approximately 30 small scale blends
- Blend preparation of approximately 20 large scale blends

**Semiworks Make/Pack:**

- Cigarette making of approximately 60 models

**Materials Evaluation:**

- Physical evaluation of the above blends and cigarettes
- CV and OV analysis of pilot plant runs

**Cigarette Testing:**

- Smoke analysis of the above cigarettes

**Development Engineering:**

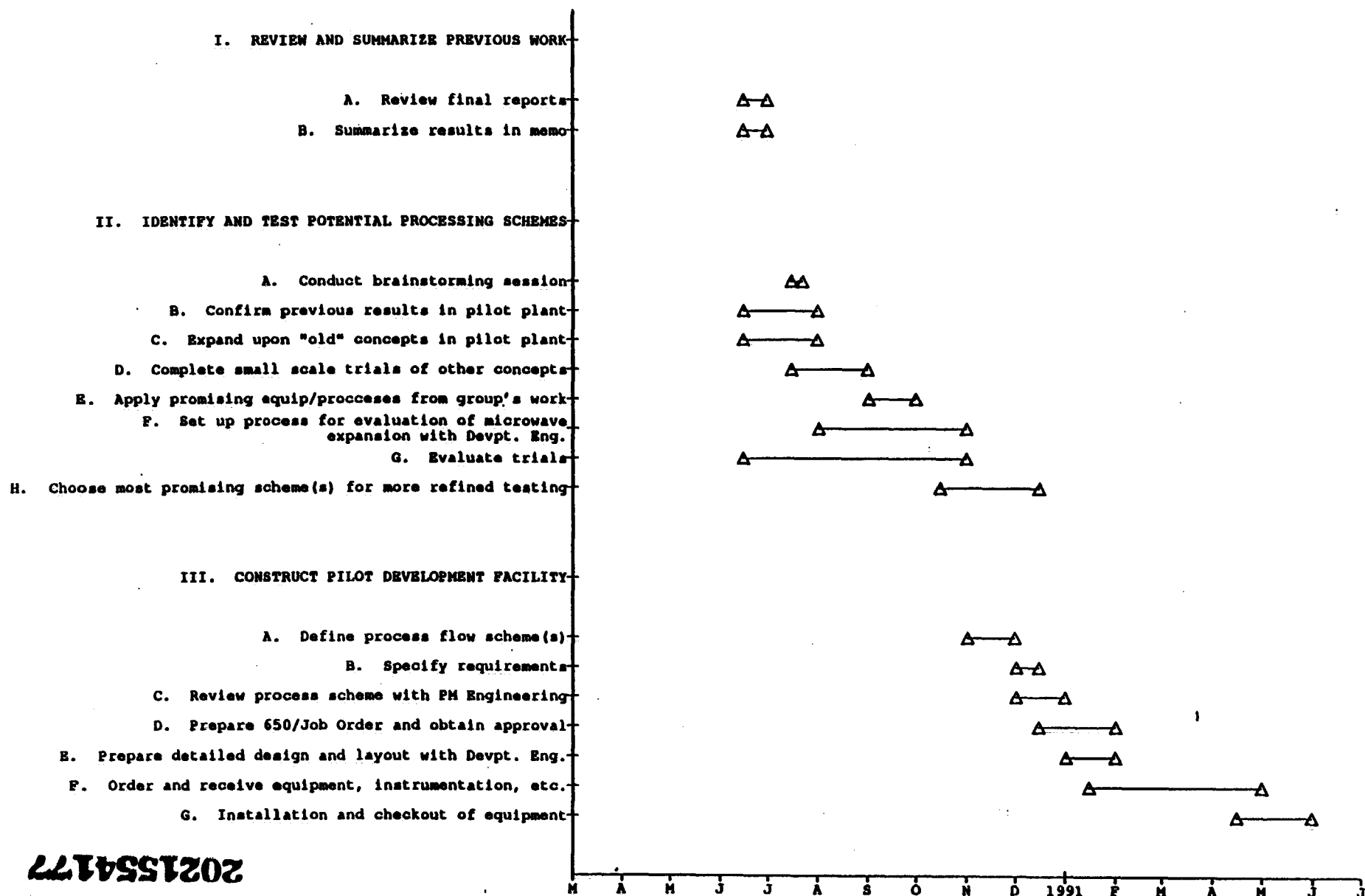
- Prototype and pilot plant design and construction

### **Resource Requirements (cont'd)**

- |                             |   |
|-----------------------------|---|
| <b>Analytical:</b>          | • Chemical analysis on approximately 75 samples   |
| <b>Technician Support:</b>  | • Assistance in completing sieve and SV analysis and in sampling<br>• Assistance in coordinating blends/cigarettes thru Semiworks |
| <b>Flavor Development:</b>  | • Assistance in identifying and addressing subjective concerns  |
| <b>Leaf Blending Group:</b> | • Assistance in subjective characterization   |
| <b>NET panel:</b>           | • Subjective screening  |

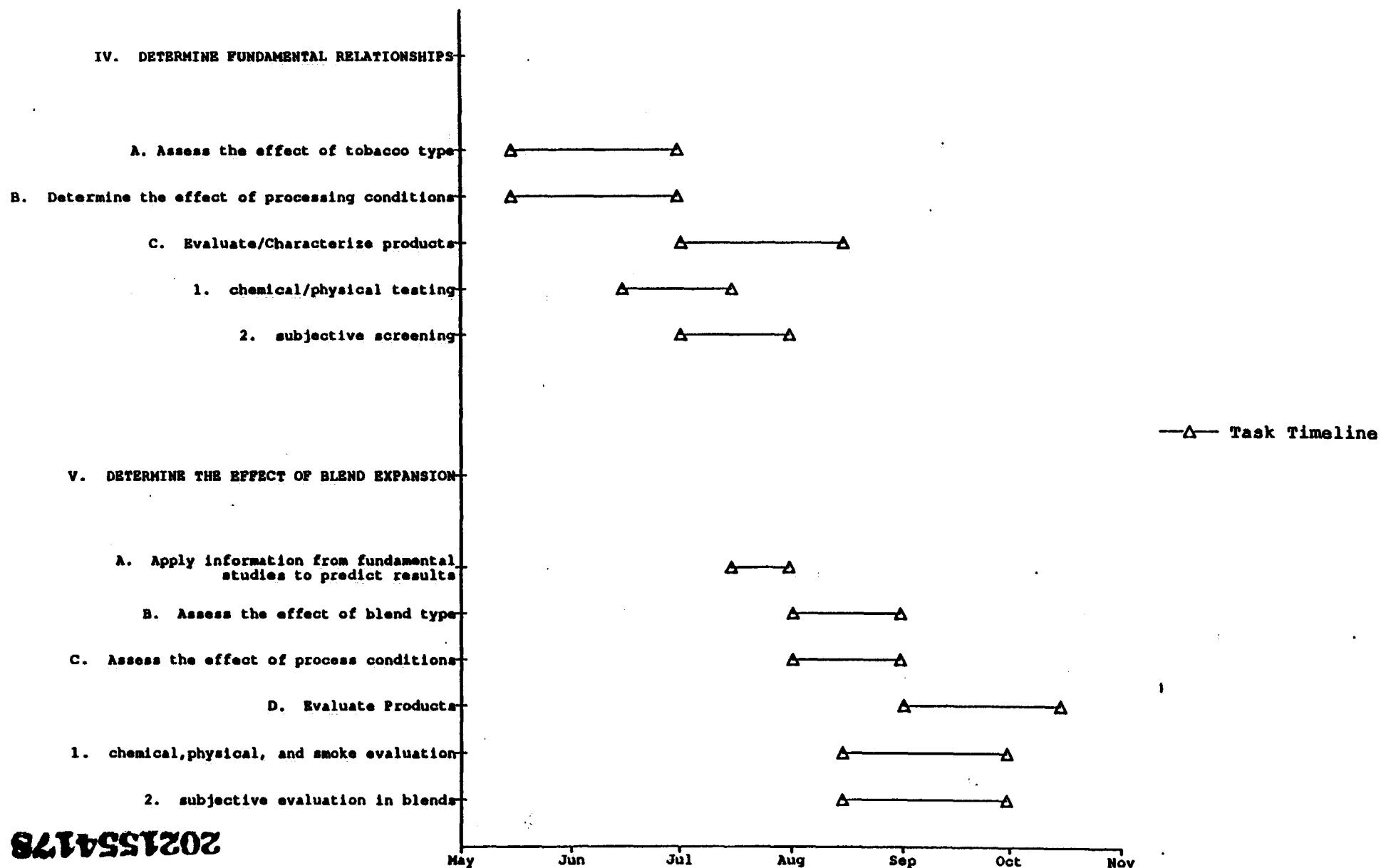


Gantt Chart of  
Development Program for Alternate Partial Expansion Processes



2021554177

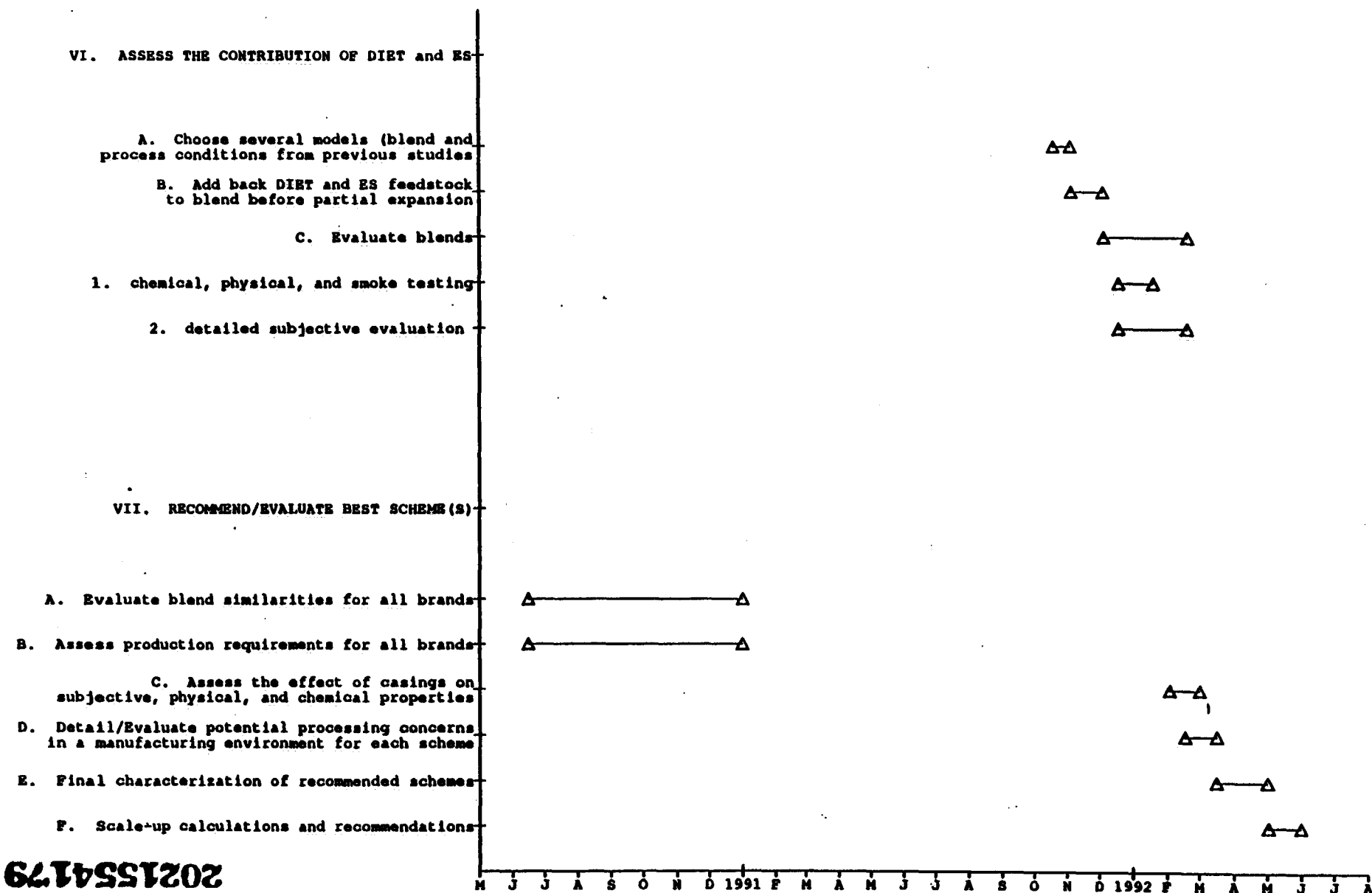
Gantt Chart of  
Partial Expansion of Tobacco with Existing DIET Process Equipment



2021554178

1991

Gantt Chart of  
Development Program for Alternate Partial Expansion Processes



2021554179